PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 94948/MRO/mro	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No. PCT/AU2003/000854	International Filing Date *(day/month/year)* 2 July 2003	Priority Date *(day/month/year)* 2 July 2002

International Patent Classification (IPC) or national classification and IPC

Int. Cl.[7] C12Q 1/60, C12N 15/29

Applicant

THE AUSTRALIAN NATIONAL UNIVERSITY et al

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

   [X] This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 4 sheet(s).

3. This report contains indications relating to the following items:

   - I [X] Basis of the report
   - II [ ] Priority
   - III [ ] Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV [ ] Lack of unity of invention
   - V [X] Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI [ ] Certain documents cited
   - VII [ ] Certain defects in the international application
   - VIII [ ] Certain observations on the international application

Date of submission of the demand	Date of completion of the report
26 November 2003	13 October 2004
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer **GARETH COOK** Telephone No. (02) 6283 2541

INTERNATIONAL PRELIM[redacted]Y EXAMINATION REPORT

[redacted]rnational application No.
PCT/AU2003/000854

I. Basis of the report

1. With regard to the elements of the international application:*

- [ ] the international application as originally filed.
- [X] the description, pages **1-106**, as originally filed,
  pages , filed with the demand,
  pages , received on with the letter of
- [X] the claims, pages **107-109**, as originally filed,
  pages , as amended (together with any statement) under Article 19,
  pages , filed with the demand,
  pages **110-113**, received on **12 August 2004** with the letter of **12 August 2004**
- [X] the drawings, pages **1-22**, as originally filed,
  pages , filed with the demand,
  pages , received on with the letter of
- [X] the sequence listing part of the description:
  pages **1-70**, as originally filed
  pages , filed with the demand
  pages , received on with the letter of

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language which is:

- [ ] the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- [ ] the language of publication of the international application (under Rule 48.3(b)).
- [ ] the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- [X] contained in the international application in written form.
- [X] filed together with the international application in computer readable form.
- [ ] furnished subsequently to this Authority in written form.
- [ ] furnished subsequently to this Authority in computer readable form.
- [ ] The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- [X] The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. [ ] The amendments have resulted in the cancellation of:
   - [ ] the description, pages
   - [ ] the claims, Nos.
   - [ ] the drawings, sheets/fig.

5. [ ] This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report*

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	**1-24, 26-34**	**YES**
	Claims	**25**	**NO**
Inventive step (IS)	Claims	**1-23, 27-34**	**YES**
	Claims	**24-26**	**NO**
Industrial applicability (IA)	Claims	**1-34**	**YES**
	Claims		**NO**

2. Citations and explanations (Rule 70.7)

The following documents identified in the International Search Report have been considered for the purposes of this report:

D1 GenBank Accession AY106598, 25 May 2002

Novelty (N)

D1 discloses an mRNA sequence from maize, which comprises SEQ ID Nos 21, 23–25, 27–29, 31–34, 36–41 and 43 and encodes SEQ ID NO: 45. The claim has been amended to define the sequence as "capable of determining or modulating the transpiration efficiency of a plant...". This is merely defining an inherent property of the compound and does not differentiate the compound as claimed from the compound disclosed in the prior art. When a compound is known in the prior art, a claim can only be novel when it is limited to a new use for that compound. Hence claim 25 is not novel.

Inventive Step (IS)

Claims 24 to 26 lack an inventive step in the light of D1. The disclosure of D1 is discussed above. Claim 24 differs from the disclosure of the citation in the provision of ERECTA sequences from wheat, rather than maize. Claim 25 (partially) differs from the disclosure of the citation in the provision of further maize ERETA sequences or sequence fragments. Such sequences of claims 24 and 25 could be readily identified by a person skilled in the art, without the exercise of inventive ingenuity, when supplied with the sequence information of the citation. Claim 26 differs from the citation in the provision of a gene construct comprising the sequence operably linked to a plant promoter. Such genetic construction is a matter of routine and does not reflect an inventive step.

Claim 24 has been amended in a similar manner to claim 25. The comments with respect to claim 25 are also applicable to claim 24.

Industrial applicability (IA)

Claims 1–35 meet the requirements of the PCT in regard to industrial applicability.

16. The method according to any one of claims 12 to 14 wherein the *ERECTA* gene or allelic variant or protein-encoding region is introduced to the plant by a process comprising transforming plant material with a gene construct comprising the gene or allelic variant or protein-encoding region thereof.

17. The method according to any one of claims 12 to 16 further comprising expressing the introduced gene or allelic variant or protein encoding region in the plant.

18. The method according to any one of claims 12 to 17 wherein transpiration efficiency is enhanced in the plant.

19. The method of claim 18 wherein the transpiration efficiency is enhanced as a consequence of the ectopic expression of an *ERECTA* allele or the protein-encoding region thereof in the plant.

20. The method according to any one of claims 12 to 17 wherein transpiration efficiency is reduced in the plant.

21. The method of claim 20 wherein the transpiration efficiency is reduced as a consequence of reduced expression of an *ERECTA* allele in the plant.

22. A plant having modified transpiration efficiency compared to a near-isogenic plant wherein said plant is produced by a process comprising performing the method according to any one of claims 12 to 21.

23. The plant of claim 22 selected from the group consisting of a rice plant, a wheat plant and a maize plant.

24. An isolated *ERECTA* gene from wheat capable of determining or modulating the transpiration efficiency of a plant wherein said isolated *ERECTA* gene comprises a nucleotide sequence selected from the group consisting of:

(i) a sequence selected from the group consisting of: SEQ ID NO: 11, SEQ ID NO: 12, SEQ ID NO: 13, SEQ ID NO: 14, SEQ ID NO: 15, SEQ ID NO: 16, SEQ ID NO: 17, SEQ ID NO: 18, and SEQ ID NO: 19;

(ii) a sequence encoding the amino acid sequence set forth in SEQ ID NO: 20; and

(iii) a sequence that is complementary to (i) or (ii).

25. An isolated *ERECTA* gene from maize capable of determining or modulating the transpiration efficiency of a plant wherein said isolated *ERECTA* gene comprises a nucleotide sequence selected from the group consisting of:

(i) a sequence selected from the group consisting of: SEQ ID NO: 21, SEQ ID NO: 22, SEQ ID NO: 23, SEQ ID NO: 24, SEQ ID NO: 25, SEQ ID NO: 26, SEQ ID NO: 27, SEQ ID NO: 28, SEQ ID NO: 29, SEQ ID NO: 30, SEQ ID NO: 31, SEQ ID NO: 32 SEQ ID NO: 33, SEQ ID NO: 34, SEQ ID NO: 35, SEQ ID NO: 36, SEQ ID NO: 37, SEQ ID NO: 38; SEQ ID NO: 39, SEQ ID NO: 40, SEQ ID NO: 41, SEQ ID NO: 42, SEQ ID NO: 43 and SEQ ID NO: 44;

(ii) a sequence encoding the amino acid sequence set forth in SEQ ID NO: 45; and

(iii) a sequence that is complementary to (i) or (ii).

26. A gene construct comprising the isolated *ERECTA* gene according to claim 24 or 25 operably in connection with a promoter sequence that is operable in a plant.

27. Use of an isolated *ERECTA* gene or allelic variant or protein-encoding region thereof in the preparation of a genetic construct for modulating the transpiration efficiency of a plant.

28. Use according to claim 27 wherein the *ERECTA* gene or allelic variant or protein-encoding region comprises a nucleotide sequence selected from the group consisting of:

(a) a sequence having at least about 55% identity to a sequence selected from the group consisting of SEQ ID NO: 1, SEQ ID NO: 3, SEQ ID NO: 5, SEQ ID NO: 7, SEQ ID NO: 9, SEQ ID NO: 11, SEQ ID NO: 12, SEQ ID NO: 13, SEQ ID NO: 14, SEQ ID NO: 15, SEQ ID NO: 16, SEQ ID NO: 17, SEQ ID NO: 18,

SEQ ID NO: 19; SEQ ID NO: 21, SEQ ID NO: 22, SEQ ID NO: 23, SEQ ID NO: 24, SEQ ID NO: 25, SEQ ID NO: 26, SEQ ID NO: 27, SEQ ID NO: 28, SEQ ID NO: 29, SEQ ID NO: 30, SEQ ID NO: 31, SEQ ID NO: 32 SEQ ID NO: 33, SEQ ID NO: 34, SEQ ID NO: 35, SEQ ID NO: 36, SEQ ID NO: 37, SEQ ID NO: 38; SEQ ID NO: 39, SEQ ID NO: 40, SEQ ID NO: 41, SEQ ID NO: 42, SEQ ID NO: 43 and SEQ ID NO: 44; and

(b) a sequence encoding an amino acid sequence having at least about 55% identity to an amino acid sequence selected from the group consisting of SEQ ID NO: 2, SEQ ID NO: 4, SEQ ID NO: 6, SEQ ID NO: 8, SEQ ID NO: 10, SEQ ID NO: 12, SEQ ID NO: 20 and SEQ ID NO: 45.

29. A method of increasing the resistance of a plant to an environmental stress comprising enhancing the level of expression of an *ERECTA* gene or allelic variant thereof or protein encoding region thereof in said plant.

30. A method of increasing seed or grain weight in a plant comprising enhancing the level of expression of an *ERECTA* gene or allelic variant thereof or protein encoding region thereof in said plant.

31. A method of increasing the number of seeds produced by a plant comprising enhancing the level of expression of an *ERECTA* gene or allelic variant thereof or protein encoding region thereof in said plant.

32. The method of any one of claims 29 to 31, the level of expression is enhanced by introducing an *ERECTA* gene or allelic variant thereof or the protein encoding region thereof to a plant.

33. The method of claim 32 wherein the *ERECTA* gene or allelic variant or protein-encoding region comprises a nucleotide sequence selected from the group consisting of:

(a) a sequence having at least about 55% identity to a sequence selected from the group consisting of SEQ ID NO: 1, SEQ ID NO: 3, SEQ ID NO: 5, SEQ ID

NO: 7, SEQ ID NO: 9, SEQ ID NO: 11, SEQ ID NO: 12, SEQ ID NO: 13, SEQ ID NO: 14, SEQ ID NO: 15, SEQ ID NO: 16, SEQ ID NO: 17, SEQ ID NO: 18, SEQ ID NO: 19 SEQ ID NO: 21, SEQ ID NO: 22, SEQ ID NO: 23, SEQ ID NO: 24, SEQ ID NO: 25, SEQ ID NO: 26, SEQ ID NO: 27, SEQ ID NO: 28, SEQ ID NO: 29, SEQ ID NO: 30, SEQ ID NO: 31, SEQ ID NO: 32 SEQ ID NO: 33, SEQ ID NO: 34, SEQ ID NO: 35, SEQ ID NO: 36, SEQ ID NO: 37, SEQ ID NO: 38; SEQ ID NO: 39, SEQ ID NO: 40, SEQ ID NO: 41, SEQ ID NO: 42, SEQ ID NO: 43 and SEQ ID NO: 44; and

(b) a sequence encoding an amino acid sequence having at least about 55% identity to an amino acid sequence selected from the group consisting of SEQ ID NO: 2, SEQ ID NO: 4, SEQ ID NO: 6, SEQ ID NO: 8, SEQ ID NO: 10, SEQ ID NO: 12, SEQ ID NO: 20 and SEQ ID NO: 45.

34. A plant produced by the method of any one of claims 29 to 34.